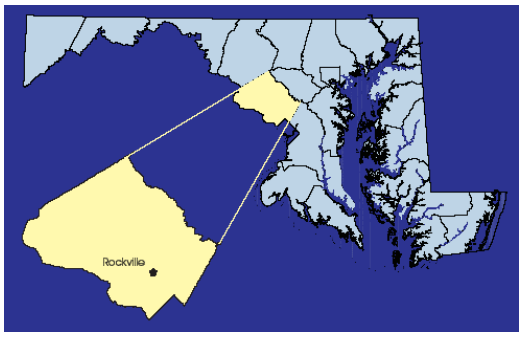
## 8.18 MONTGOMERY COUNTY

This chapter presents information about stream conditions of potential management interest in Montgomery County based on the 2000-2004 Maryland Biological Stream Survey (MBSS) results. Information from MBSS data collected between 1994 and 1997 can be found in MDNR 2001p.




### 8.18.1 Ecological Health

Based on the three ecological health indicators used by the MBSS, the overall condition of Montgomery County streams during 2000-2004 was Poor (Figures 8-141). The FIBI results indicate that 33% of the streams in the county were in Good condition, while only 11% rated Good using the BIBI. In contrast, 46% of the streams in the county scored as Poor or Very Poor using the CBI, while only 4% scored as Good and about 51% scored as Fair.

Areas with Good IBI scores were almost exclusively located in the western and extreme northern sections of the county. Conversely, areas with the lowest IBI rating (Very Poor) were concentrated in the center and eastern portion of the county. The highest rated stream in Montgomery County using the Combined Biotic Index (CBI) was the mainstem Patuxent River in the Brighton Dam section, while the lowest rated streams included Willett Branch, as well as unnamed tributaries to the Potomac River and Cabin John Creek (Table 8-35). Based on Stream Waders volunteer data, the Cabin John and Anacostia River watersheds were dominated by sites rated as Very Poor for benthic macroinvertebrates (Table 8-36).

### 8.18.2 Physical Habitat

#### 8.18.2.1 Overall Condition

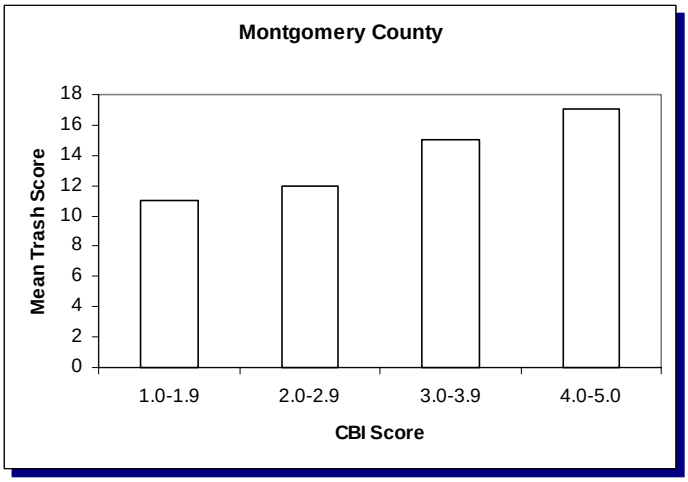
Based on the Physical Habitat Index (PHI), 16% of the streams in Montgomery County had Minimally Degraded habitat, 58% had Partially Degraded habitat, and 26% had Degraded or Severely Degraded habitat (Figure 8-142). Sites rated as having Minimally Degraded physical habitat were located primarily along the northern and western borders of the county. In contrast, there was no apparent pattern in the location of the few sites with Severely Degraded habitat.

### 8.18.3 Trash

Nearly 55% of the stream miles in Montgomery County were rated Optimal for trash (Figure 8-143). In contrast, 26% of streams were rated as being in Marginal or Poor condition. Sites with high levels of human refuse were located primarily in the southeastern portion of the county, while sites with little or no trash were found mostly in the northwestern half of Montgomery County.

**TRASH VS CBI**

Trash, or human refuse, is common along roadways and streams in Maryland's urban and urbanizing areas. In Montgomery County, there was a strong negative relationship between the amount of trash at a site and its Combined Biotic Index score. Potential reasons for this relationship include illegal dumping and runoff of pollutants from associated impervious areas.




Montgomery County Trash vs. CBI score bar graph

#### 8.18.3.1 Channelization

About 22% of the stream miles in Montgomery County were partly or completely channelized (Table 8-4). Based on the 3.3% estimate of complete channelization from Table 8-3, most channelized areas are relatively small. Examples of sites with partial channelization included road crossings and armoring of problematic stream bends to protect property or infrastructure. Rip-rap (14%), concrete channels (6%) and culvert pipes (2%) were the most common types of channelization (Figure 8-144). No strong geographic trends were evident, except that rip-rap occurred mostly in the general vicinity of Rockville.

#### 8.18.3.2 Inadequate Riparian Buffer

An estimated 8% of the stream miles in Montgomery County had no riparian buffers during the 2000-2004 MBSS (Table 8-3). In addition, 11% of stream miles had severe breaks in existing riparian buffers. There was no geographic pattern evident in the distribution of sites with inadequate riparian buffer (Figure 8-145). A similar lack of concentration was evident for streams with severe breaks in the riparian buffer zone. Additional information about buffer breaks, analyzed by county, is provided in: 2000-2004 Maryland Biological Stream Survey Volume 10: Riparian Zone Conditions (http:www/dnr/Maryland. gov/streams/pubs/ea05-7_riparian.pdf).

#### 8.18.3.3 Eroded Banks/Bedload Movement

Nearly 35% of the stream miles in Montgomery County were rated as having minimal (Optimal) levels of bank erosion (Figure 8-146). In contrast, 14% of stream miles were rated Poor for erosion and an additional 20% were rated as Marginal. Sites with bank erosion problems were widely distributed throughout the county, but appeared to be more frequent in the northern portion of the county. Possible reasons for this distribution include legacy agricultural impacts, the concentration of channel restoration activities in the southeastern half of the county, and/or the fact that the northern portion of the county is in a geological zone that is dominated by phyllite, a highly erodible material.

A variety of degrees of bar formation were present in the streams of Montgomery County (Figure 8-146). About 18% of stream miles were devoid of bars, and bar formation was rated as minor in 32% of streams. In contrast, bar formation was moderate in 30% of streams, and bars were extensive in 20% of stream miles. Streams with minimal or no bar formation appeared to be primarily located along the northern and eastern borders of the county.

### 8.18.4 Key Nutrients

#### 8.18.4.1 Nitrate-Nitrogen

Nearly 80% of stream miles in Montgomery County had nitrate-nitrogen levels elevated above those found in forested streams in Maryland (Figure 8-147). Of these stream miles, 6% had levels above the threshold where biological effects have been documented. Most of the sites with low levels of nitrate-nitrogen were located in the western half of the county. The sites with levels above 5 mg/l were mostly concentrated in a small area west of Gaithersburg, Maryland.

#### 8.18.4.2 Total Phosphorus

Over 63% of the stream miles in Montgomery County had total phosphorus levels within the range of values found in forested streams in Maryland (Figure 8-148). Of the remaining 37% of stream miles, a total of 7% have levels above the threshold where biological effects may occur. The central portion of the county had few sites with elevated levels of total phosphorus. The few sites with high levels were found in an east-west band located south of Gaithersburg.

### 8.18.5 Stream and River Biodiversity

To provide a means to prioritize stream systems for bio-diversity protection and restoration within each county and on a statewide basis, a tiered watershed and stream reach prioritization method was developed. Special emphasis was placed on state-listed species, stronghold watersheds for state-listed species, and stream reaches with one or more state-listed aquatic fauna. Fauna considered included stream salamanders, freshwater fishes, and freshwater mussels. Rare, pollution-sensitive benthic macroinvertebrates collected during the 1994-2004 MBSS were also used to identify the suite of watersheds necessary to conserve the full array of known stream and river biota in Maryland. A complete description of the biodiversity ranking process is found in: 2000-2004 Maryland Biological Stream Survey Volume 9: Stream and Riverine Biodiversity (http:www/dnr/ Maryland.gov/streams/pubs/ea05-6_biodiv.pdf).

Of the seven watersheds found in Montgomery County, Rocky Gorge Dam and Potomac River Montgomery County were classified as Tier 1, meaning that these watersheds serve as strongholds for one or more state listed aquatic species (Figure 8-149). In contrast, the Seneca Creek watershed was among the lower ranking for stream and river biodiversity in the state ($77^{th}$ of 84).

**AN IMPORTANT NOTE ON BIODIVERSITY MANAGEMENT**

Perhaps the largest ongoing natural resources restoration and protection effort in Maryland is associated with the Chesapeake Bay. In most cases, freshwater biodiversity is not specifically considered during placement and prioritization of Bay restoration and protection projects. In this report and in the more detailed volume in the series on aquatic biodiversity, a system of biodiversity ranking is presented to provide counties and other stewards with a means to plan appropriate protection and restoration activities in locations where they would most benefit stream and river species. Given the historically low level of funding for biodiversity protection and restoration in Maryland and elsewhere, the potential benefit of incorporating freshwater biodiversity needs into other efforts is quite large.

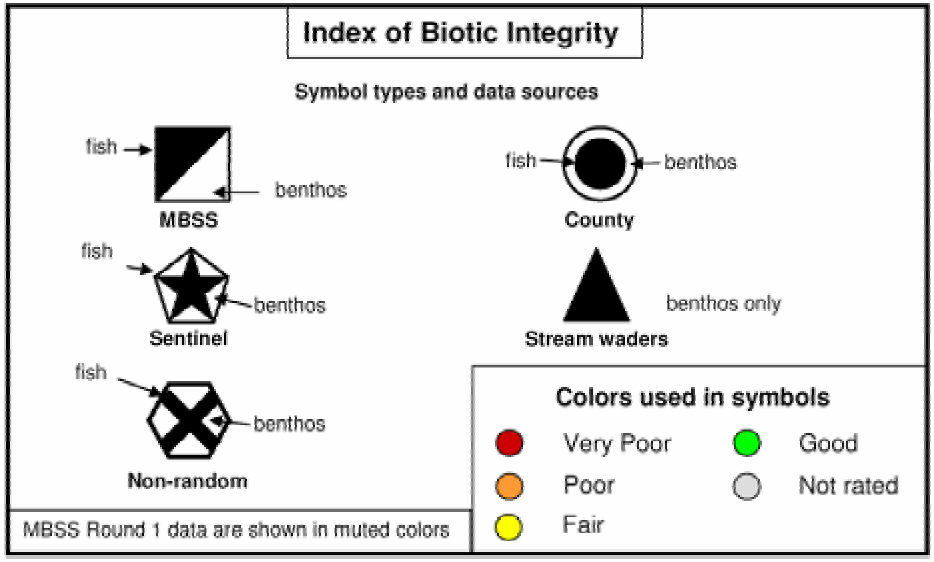
However, it is important to note that although freshwater taxa are the most imperiled group of organisms in Maryland, other groups and individual species not typically found in freshwater habitats are also at high risk and constitute high priority targets for conservation. In addition, freshwater taxa that prefer habitats such as small wetlands may not be well-characterized by the ranking system employed here. To conserve the full array of Maryland's flora and fauna, it is clearly necessary to use other, landscape-based tools and consider factors such as maintaining or reconnecting terrestrial travel corridors.

Any reaches that had either state-listed or GCN species, or high intactness values were highlighted to facilitate additional emphasis in planning restoration and protection activities.

### 8.18.6 Stressors

At 98% of stream miles, the most extensive stressor characterized by the MBSS in Montgomery County during the 2000-2004 MBSS was non-native terrestrial plants in the riparian zone (Figure 8-5). Other stressors found were: streams with non-native aquatic fauna (present in 69% of stream miles); eroded banks (46% of stream miles); streams with > 5% urban land use upstream (40% of stream miles); streams with no riparian buffer (8% of stream miles); high nitrate-nitrogen (6% of stream miles); channelized streams (3% of stream miles); and acid deposition (2%).

# Key to MBSS 2000-2004 County Maps




Tier 1: Stronghold watershed (most robust remaining population) for one or more state-listed fish, aquatic herpetofauna, or freshwater mussels.

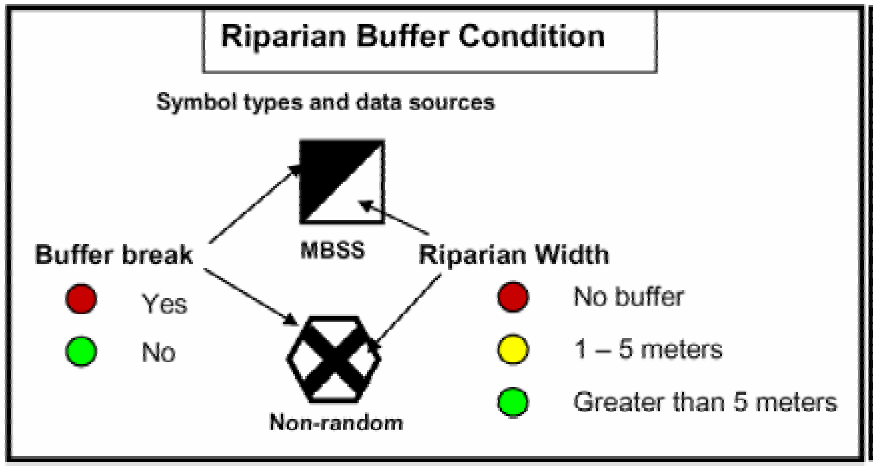
Tier 2: Stronghold watershed for one or more non-state listed species of greatest conservation need (GCN) fish, aquatic herpetofauna, or freshwater mussels, that also had state-listed fish, aquatic herpetofauna, or freshwater mussels present.

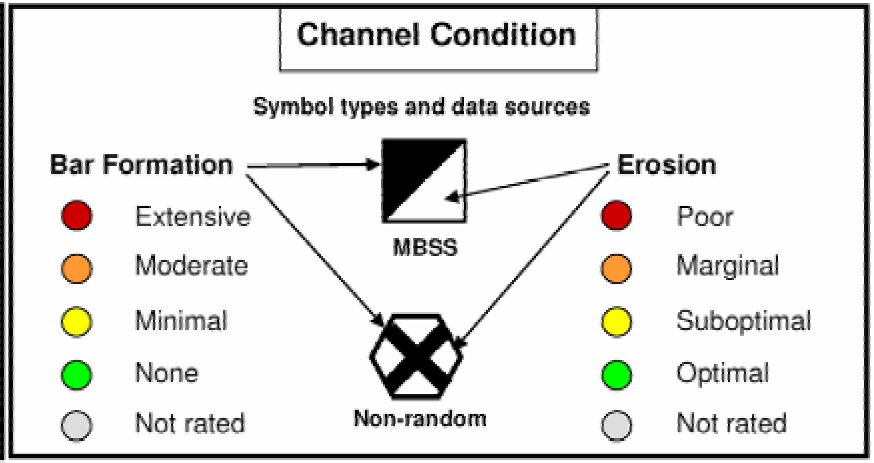
Tier 3: Stronghold watershed for one or more non-state listed GCN fish, aquatic herpetofauna, or freshwater mussels, no state-listed fish, aquatic herpetofauna, or freshwater mussels present.

Tier 4: Non-stronghold watershed with one or more state-listed fish, aquatic herpetofauna, or freshwater mussels present.

Tier 5: Not of the above, but a biodiversity conservation watershed. In other words, part of the network of watersheds that must be conserved to keep all native fishes, aquatic herpetofauna, freshwater mussels, and rare, pollution sensitive benthic macroinvertebrates extant in Maryland.

Tier 6: Not of the above.



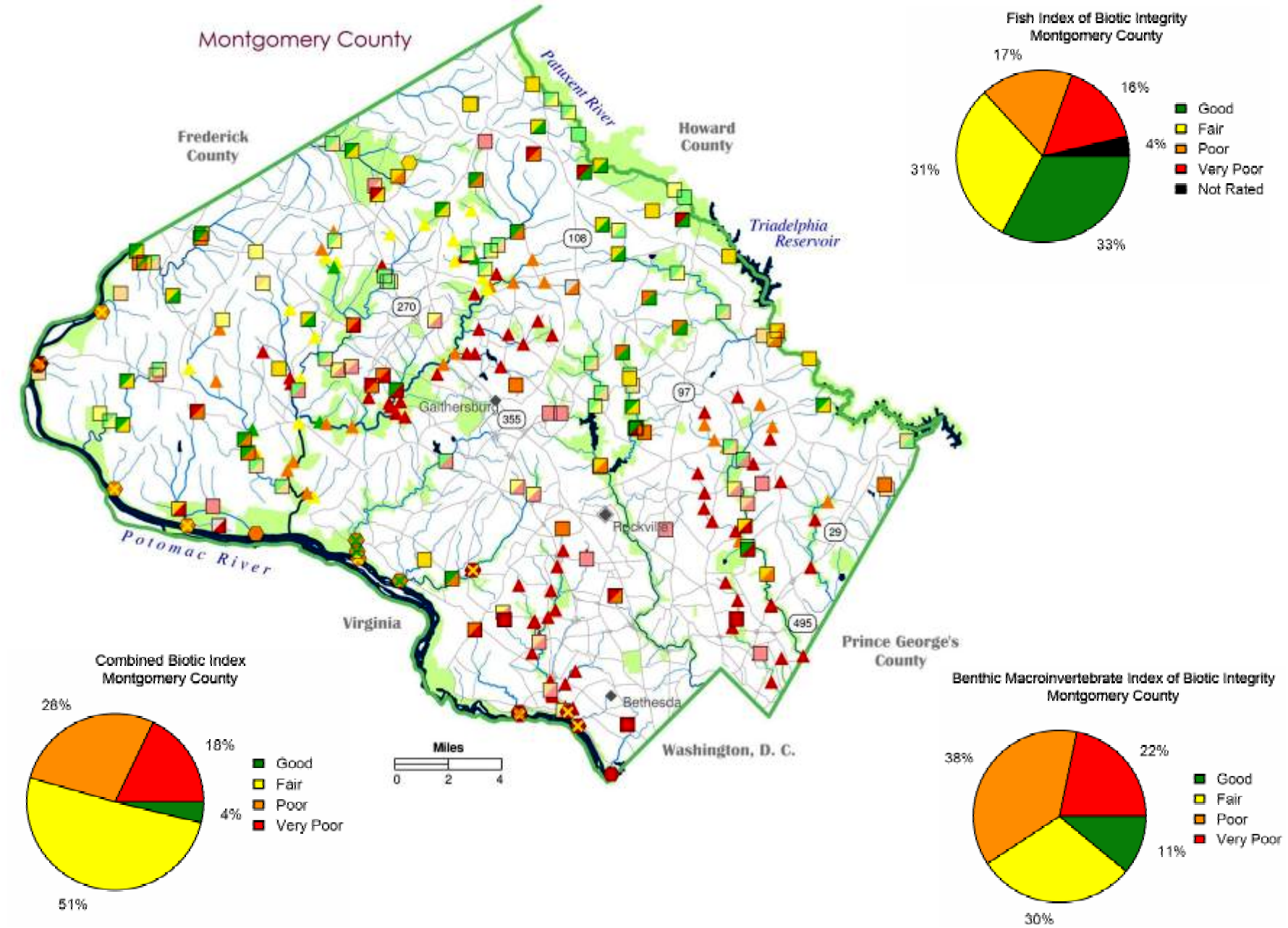



Figure 8-141. Benthic Index of Biotic Integrity (BIBI) and Fish Index of Biotic Integrity (FIBI) pie charts and map of stream health for Montgomery County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie charts represent 2000-2004 data only, Combined Biotic Index pie chart represents mean of FIBI and BIBI)

Table 8-35. MBSS sites sampled in Montgomery County during 1994- 2004, ranked by Combined Biotic Index Score (CBI)

Montgomery County - MBSS Sites

| SITE NUMBER | STREAM NAME | WATERSHED | CBI |
|---|---|---|---|
| ***Best (in order of CBI score)*** | | | |
| MO-P-252-323-97 | Mainstem Patuxent River | Brighton Dam | 4.83 |
| MO-P-024-307-97 | Little Seneca Creek | Seneca Creek | 4.50 |
| HO-P-132-312-97 | Mainstem Patuxent River | Brighton Dam | 4.33 |
| BRIG-307-R-2000 | Mainstem Patuxent River | Brighton Dam | 4.33 |
| BRIG-111-R-2000 | Scotts Branch | Brighton Dam | 4.33 |
| HO-P-194-310-97 | Mainstem Patuxent River | Brighton Dam | 4.17 |
| HO-P-214-311-97 | Mainstem Patuxent River | Brighton Dam | 4.17 |
| MO-P-248-125-96 | Bennett Creek | Monocacy River Lower | 4.13 |
| MO-P-445-318-97 | Great Seneca Creek | Seneca Creek | 4.13 |
| PRMO-110-R-2002 | Broad Run | Potomac River | 4.08 |
| MO-P-276-211-97 | Wild Cat Branch | Seneca Creek | 4.08 |
| MO-P-126-206-97 | Hawlings River | Rocky Gorge Dam | 4.00 |
| RKGR-107-R-2002 | Rocky Gorge Reservoir UT3 | Rocky Gorge Dam | 4.00 |
| MO-P-366-212-97 | Ten Mile Creek | Seneca Creek | 3.96 |
| PRMO-115-R-2002 | Little Monocacy River UT2 | Potomac River | 3.96 |
| PRMO-304-R-2002 | Little Monocacy River | Potomac River | 3.88 |
| MO-P-206-311-97 | Broad Run | Potomac River | 3.83 |
| PRMO-311-R-2002 | Little Monocacy River | Potomac River | 3.83 |
| RKGR-208-R-2002 | Hawlings River UT1 | Rocky Gorge Dam | 3.83 |
| MO-P-325-208-97 | North Branch Rock Creek | Rock Creek | 3.83 |
| RKGR-110-R-2002 | Hawlings River | Rocky Gorge Dam | 3.83 |
| LMON-322-R-2003 | Little Bennett Creek | Monocacy River Lower | 3.79 |
| PRMO-307-R-2002 | Little Monocacy River | Potomac River | 3.79 |
| PRMO-202-R-2002 | Broad Run | Potomac River | 3.75 |
| PRMO-323-R-2002 | Little Monocacy River | Potomac River | 3.71 |

| SITE NUMBER | STREAM NAME | WATERSHED | CBI |
|---|---|---|---|
| ***Worst (most degraded sites first)*** | | | |
| MO-P-436-226-97 | Potomac River UT | Potomac River | 1.29 |
| CABJ-109-R-2003 | Cabin John Creek UT1 | Cabin John Creek | 1.33 |
| PRMO-109-R-2002 | Willett Branch | Potomac River | 1.33 |
| MO-P-468-109-97 | Magruder Branch | Seneca Creek | 1.33 |
| GWPY-212-N-2004 | Little Falls Branch | Potomac River | 1.34 |
| ANAC-116-R-2004 | Sligo Creek | Anacostia River | 1.50 |
| MO-P-269-203-97 | Sligo Creek | Anacostia River | 1.50 |
| MO-P-304-127-97 | Northwest Branch UT | Anacostia River | 1.50 |
| MO-P-082-124-97 | Cabin John Creek UT | Cabin John Creek | 1.50 |
| ROCK-107-R-2003 | Rock Creek UT2 | Rock Creek | 1.50 |
| MO-P-308-117-97 | Mill Creek UT | Rock Creek | 1.50 |
| MO-P-101-126-97 | Rock Creek UT | Rock Creek | 1.50 |
| SENE-112-R-2001 | Russell Branch | Seneca Creek | 1.50 |
| SENE-101-R-2001 | Great Seneca Creek UT3 | Seneca Creek | 1.67 |
| MO-P-489-323-97 | Northwest Branch | Anacostia River | 1.67 |
| MO-P-480-326-97 | Cabin John Creek | Cabin John Creek | 1.67 |
| MO-P-316-205-97 | Mill Creek | Rock Creek | 1.67 |
| SENE-115-R-2001 | Great Seneca Creek | Seneca Creek | 1.67 |
| PRMO-101-R-2002 | Horsepen Branch UT | Potomac River | 1.75 |
| COCA-209-N-2003 | Rock Run | Potomac River | 1.83 |
| MO-P-310-313-97 | Rock Creek | Rock Creek | 1.83 |
| MO-P-129-114-97 | Seneca Creek UT | Seneca Creek | 1.83 |
| SENE-316-R-2001 | Little Seneca Creek | Seneca Creek | 1.83 |
| PRMO-103-R-2002 | Rock Run | Potomac River | 1.88 |
| COCA-109-N-2003 | Potomac River UT | Potomac River | 1.92 |

Table 8-36. Stream Waders sites sampled in Montgomery County during 2000-2004, ranked by Family-level Benthic Index of Biotic Integrity.

| Montgomery County - Stream Wader Sites | | | | |
|---|---|---|---|---|
| WATERSHED | # GOOD | # FAIR | # POOR | # VERY POOR |
| Anacostia River | 0 | 1 | 7 | 23 |
| Brighton Dam | 2 | 3 | 0 | 0 |
| Cabin John Creek | 0 | 0 | 1 | 20 |
| Monocacy River Lower | 1 | 0 | 0 | 0 |
| Potomac River | 0 | 0 | 0 | 1 |
| Seneca Creek | 4 | 20 | 17 | 24 |

The Montgomery County Department of Environmental Protection began a multi-year, rotating basin sampling across the county in 1994. Each watershed within the county is visited every five years. The primary goals of the Montgomery County biomonitoring program are to characterize stream and watershed conditions, to fulfill NPDES stormwater permit requirements, assess development impacts, determine where restoration efforts should be focused, evaluate effectiveness of restoration, and to identify high-quality streams for conservation purposes (Davis et al. 2002).

The County's overall sampling design was initially developed to be directly comparable to the EPA Rapid Bioassessment Protocols (Barbour et al. 1999) and to allow for the sharing of data among agencies. A benthic macroinvertebrates and a fish Index of Biotic Integrity (IBI) were developed in 1995. Stream condition estimates are calculated from probability-based samples, however Montgomery County also uses targeted sampling to assess trends over time. Physical habitat assessments are included in their field surveys. In 2001, Montgomery County reassessed and revised their monitoring program to facilitate direct stream condition comparisons with MBSS (Roth et al. 2001).

Benthic macroinvertebrate sampling is completed during the spring index period. Fish monitoring is completed during the summer and fall. Water chemistry and physical habitat assessments are done during both. All biological stream monitoring is now done in accordance with the MBSS methods (Kazyak 2001). Laboratory processing of benthic macroinvertebrates are also consistent with the DNR lab methods.

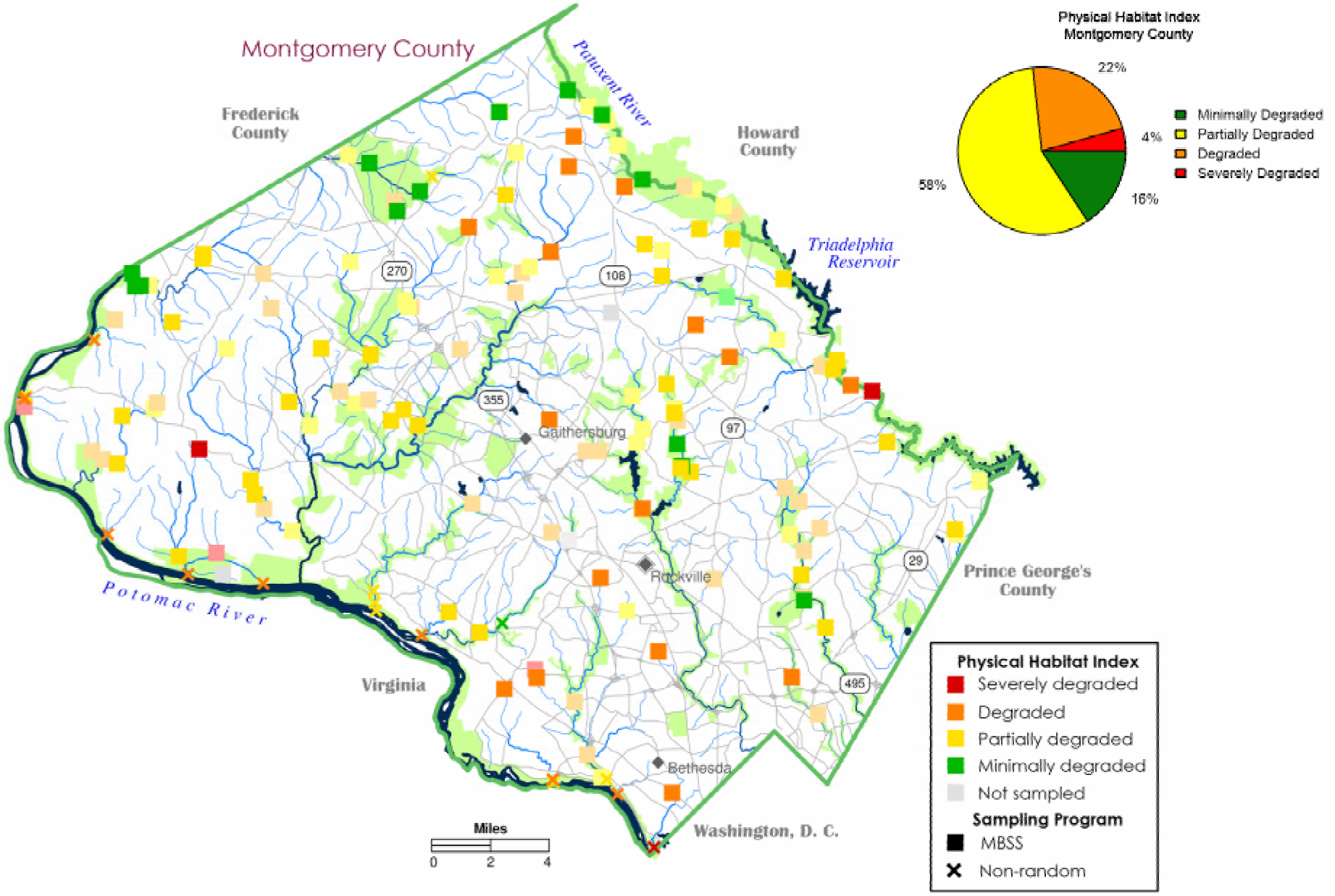



Figure 8-142. Physical Habitat Index (PHI) pie chart and map of stream habitat quality for Montgomery County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only)

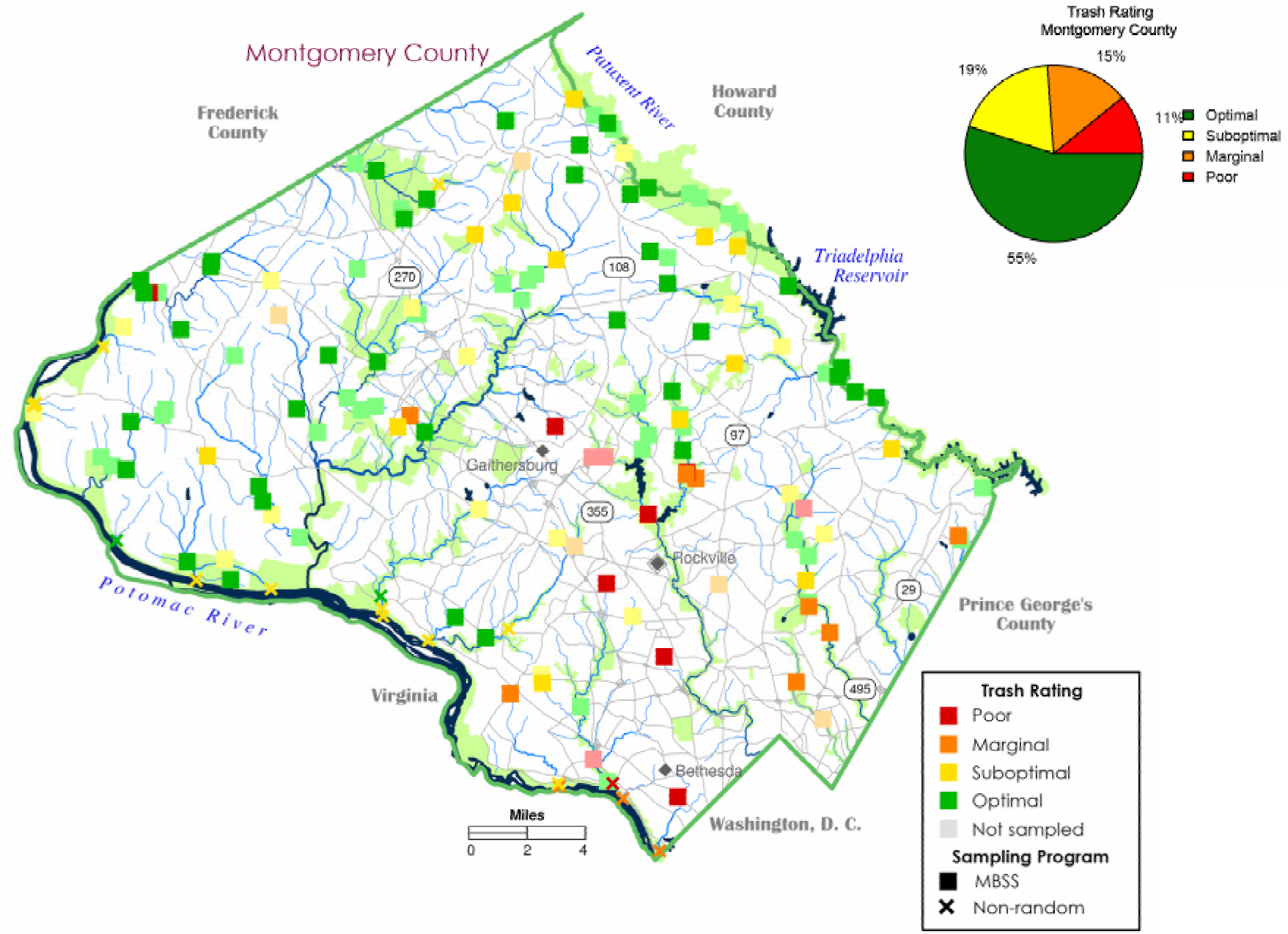



Figure 8-143. Pie chart and map of trash rating (0-20 scale) for Montgomery County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only)

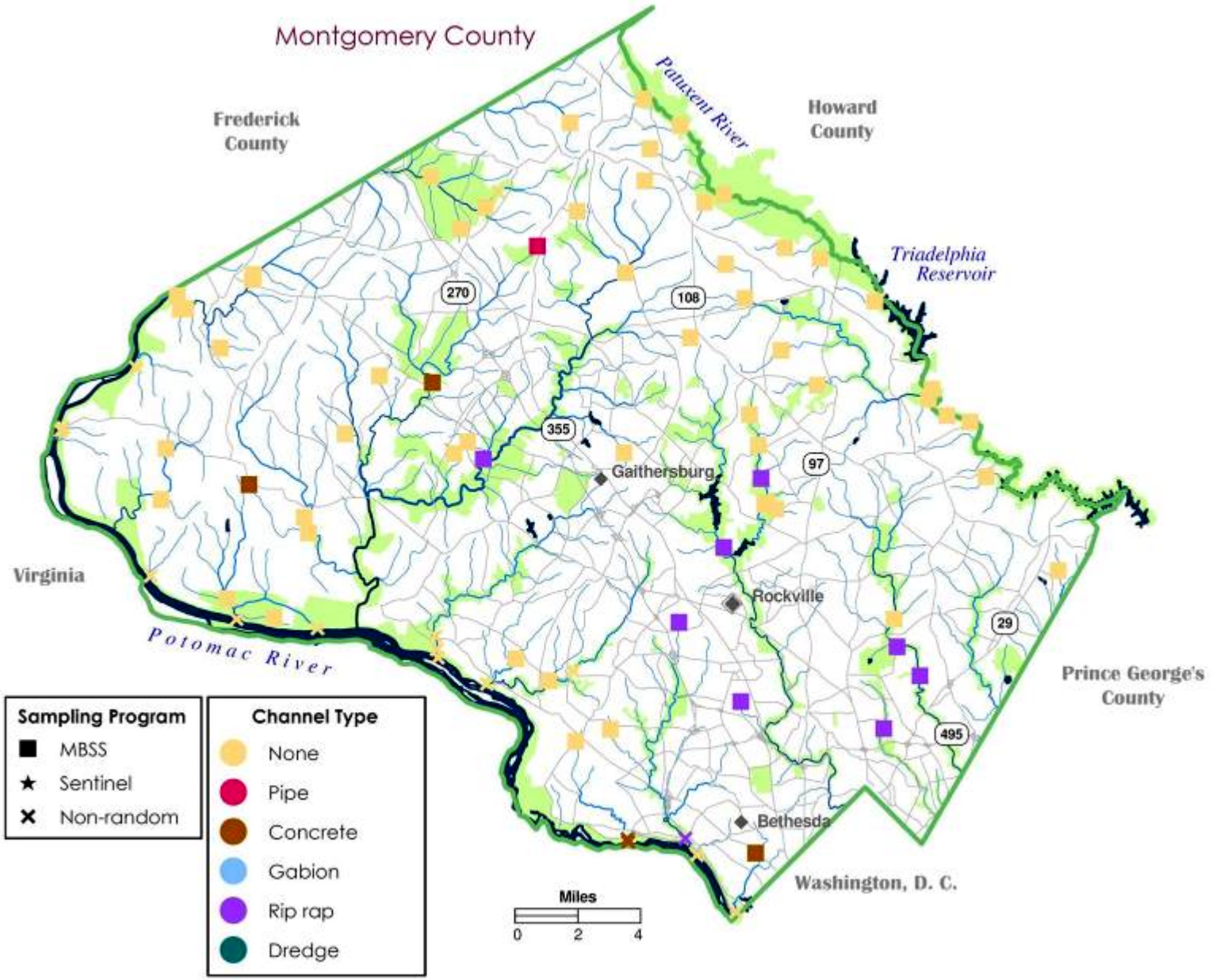



Figure 8-144. Map of channelized sites, by type, for Montgomery County streams sampled by the MBSS during 2000-2004. *NOTE: When channelization is indicated, it does not necessarily mean that the entire 75m segment was affected.*

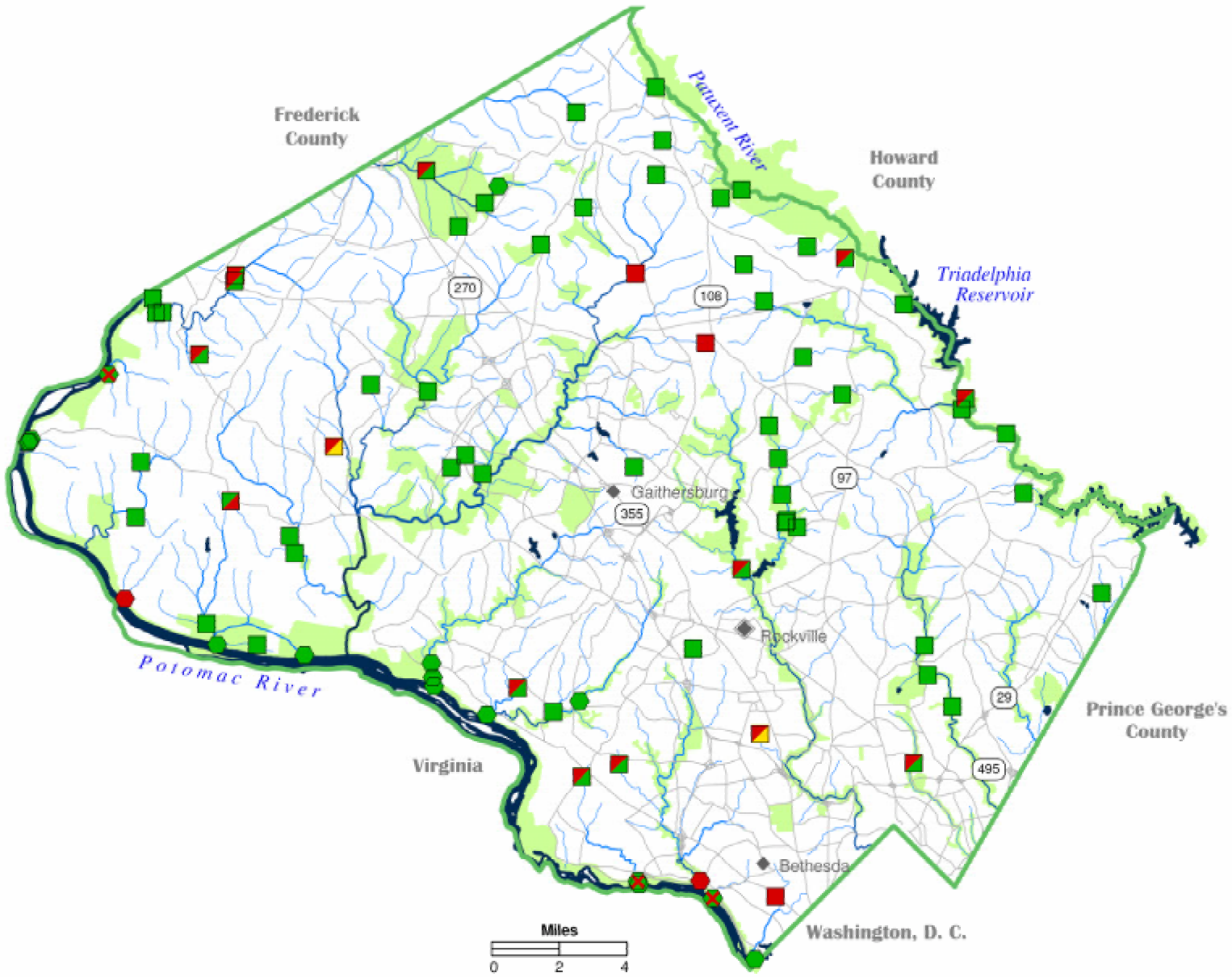



Figure 8-145. Map of sites with inadequate riparian buffers and buffer breaks for Montgomery County streams sampled by the MBSS during 2000-2004.
*NOTE: Multiple riparian buffer breaks sometimes occurred at a site; only the most severe was depicted.*

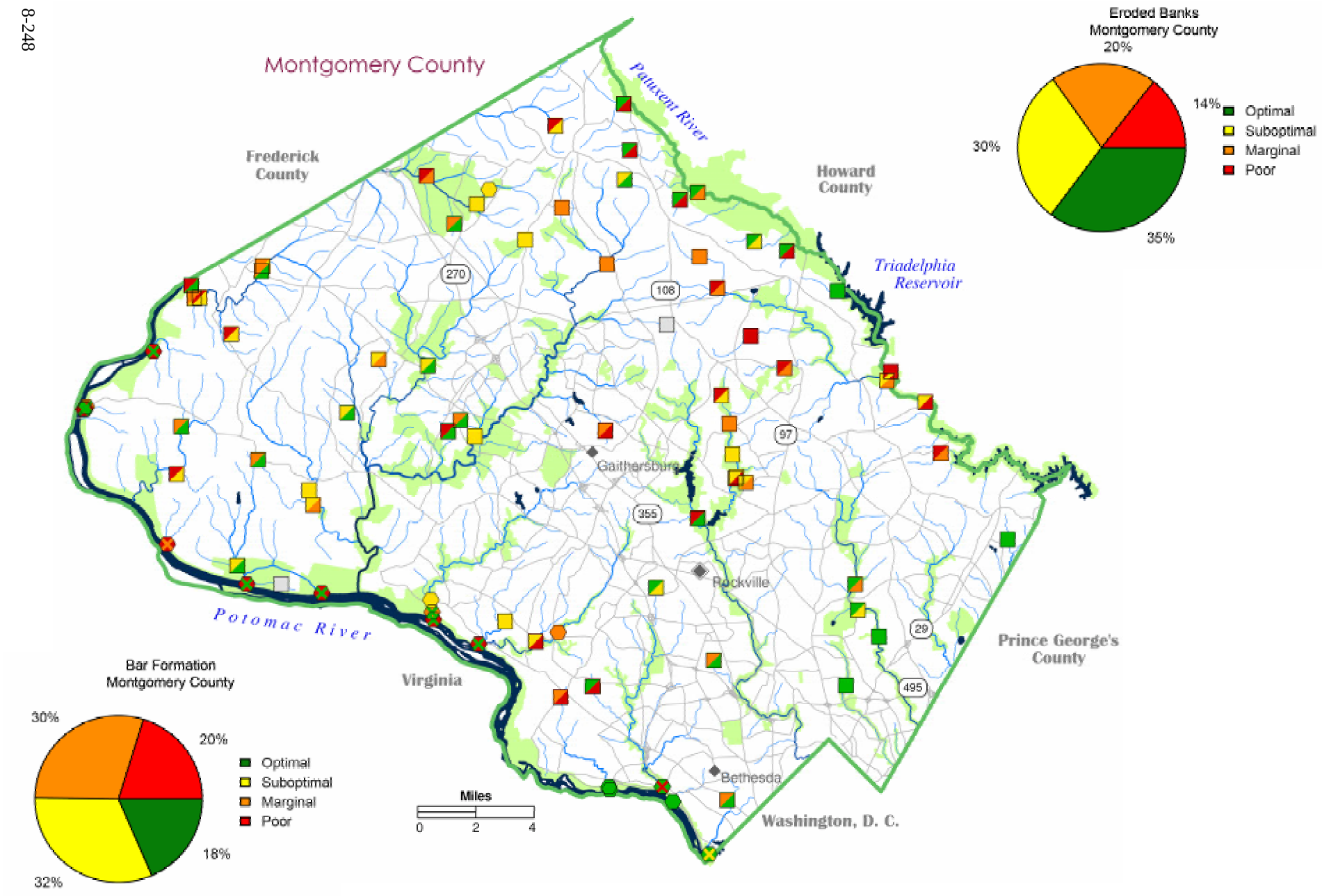



Figure 8-146. Pie charts and map of sites with eroded banks and instream bar formation for Montgomery County streams sampled by the MBSS during 2000-2004

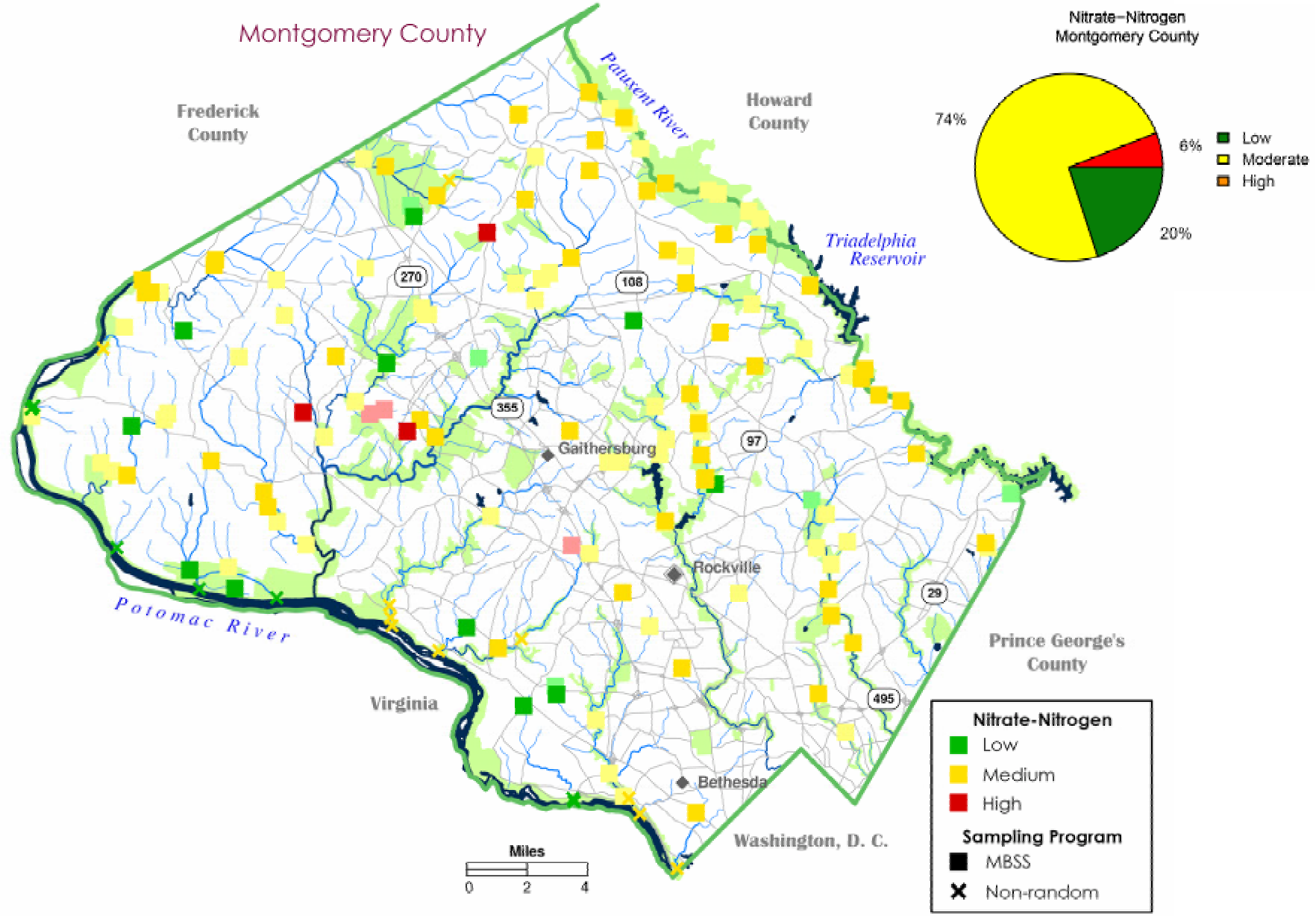



Figure 8-147. Pie chart and map of nitrate-nitrogen values (mg/l) for Montgomery County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only) (Low = 1.0, Medium = 1.0 – 5.0, High = > 5.0)

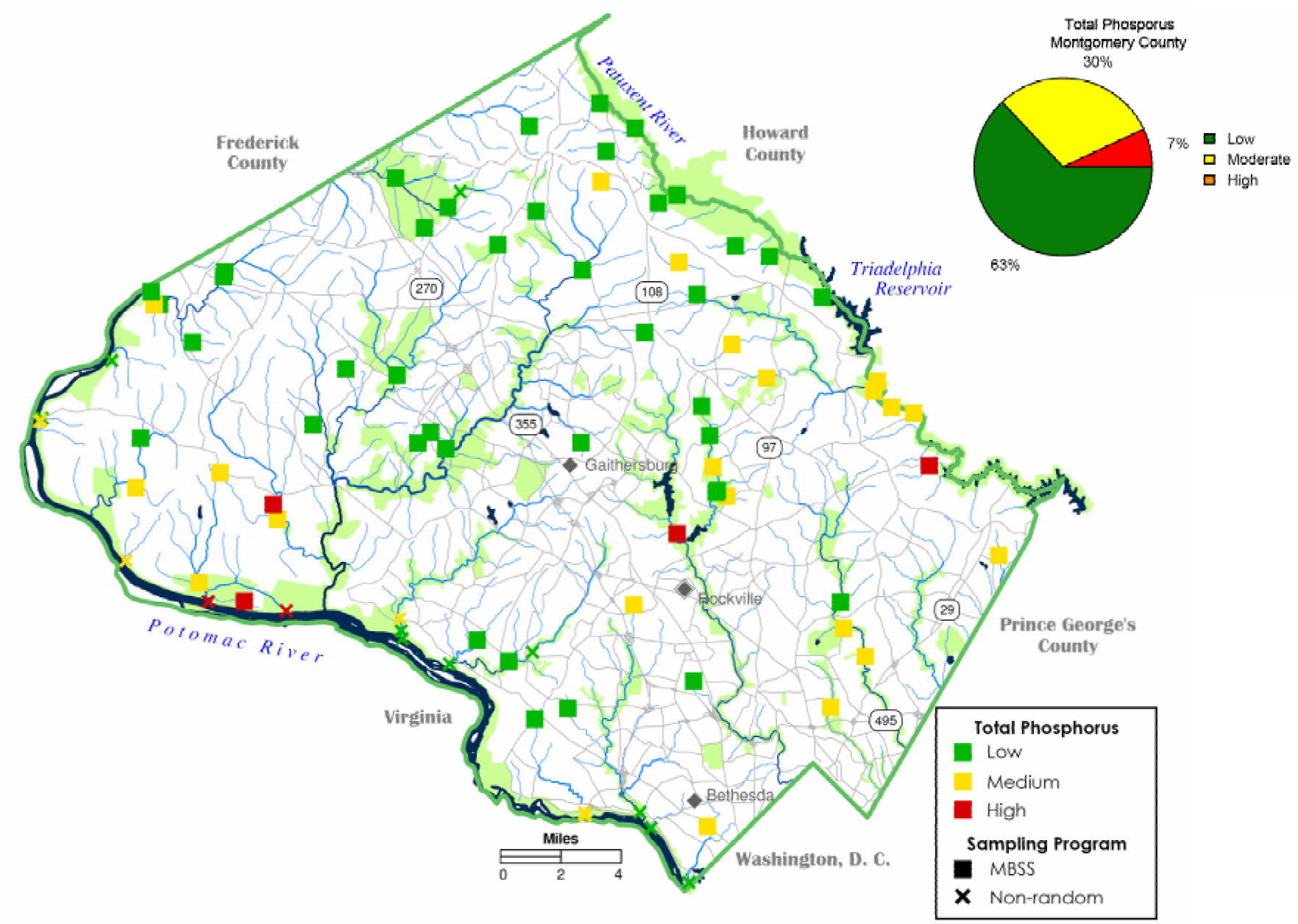



Figure 8-148. Pie chart and map of total phosphorus values (mg/l) for Montgomery County streams sampled by the MBSS during 2000-2004 (Low = < 0.025, Medium = 0.025 – 0.07, High = > 0.07)

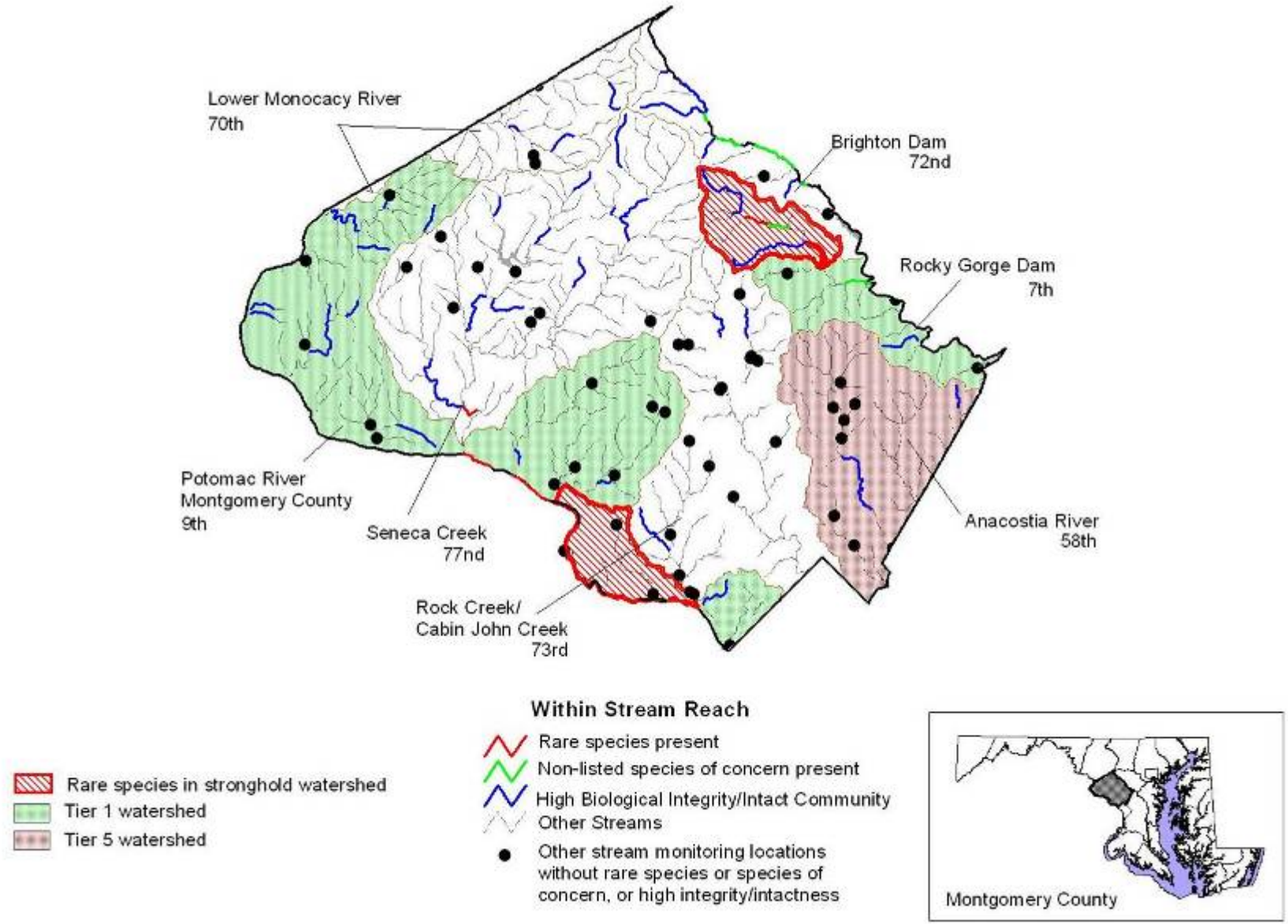



Figure 8-149. Aquatic Heritage Biodiversity Ranking map for Montgomery County, by watershed. Data from MBSS 1994-2004, MBSS qualitative data, Raesly, unpub. data, Harris 1975, Thompson 1984, and DNR Natural Heritage Program database.